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ILLUSTRATIONS

OF THE

ANATOMY OF THE PELVIS.

BY

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Ad origines enim morborum occultas indagandas, et per causas intelligendas, rationibusque intrinsecis, firmisque explicandas, neminem latet, quantum Anatome conferat.

Præfat. ad Tab. SANTORINI.

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&c. &c.

A GENTLEMAN NO LESS DISTINGUISHED

BY HIS EMINENCE IN HIS PROFESSION,

THE EXTENT OF HIS MEDICAL KNOWLEDGE,

AND

BY HIS VARIOUS PUBLICATIONS ON THE PATHOLOGY OF THE

HUMAN FRAME,

THAN

BY HIS ZEAL FOR THE IMPROVEMENT OF MEDICINE,

THIS VOLUME

IS MOST RESPECTFULLY DEDICATED,

BY HIS MOST SINCERE FRIEND,

THE AUTHOR.

INTRODUCTION.

MANY years ago I submitted to the Public a Fasciculus of Engravings, illustrative of the Anatomy of the Bowels, of the Chest, and of the Abdomen, which having been very favourably received, has led me to publish the annexed Engravings of the Pelvis, and its contents. It has been generally admitted, that verbal description alone is inadequate to convey to the mind just impressions of figure, and relative situation. The mathematician requires the aid of Diagrams; the geographer that of Maps; and the student of Anatomy is under the necessity of taking the aid of Figures of the Bones, Muscles, Bowels, &c. to give correct views of his subject.

Engravings are not only useful to him who is beginning the study of Anatomy, but also to him who is engaged in the practice of Surgery, of Midwifery, or of Physic. The details of Anatomy, in the course of a few years, are too apt to escape from the mind. These, however, are essential to the safe performance of the more delicate, difficult, and dangerous operations of Surgery, as the operations of Lithotomy, Hernia, and Aneurism; and they are not to be gained from mere verbal description, but by an appeal to nature, or to anatomical engravings. The former is probably not to be had when required, even in large cities; the parts cannot be seen dissected in the manner that is requisite; correct Plates are therefore the only sources from which satisfactory information can be obtained.

The number of anatomical figures that have been published, is sufficient evidence of the utility of such a mode of illustration, and of that kind of illustration being duly appreciated. But some of the more valuable of these are not to be procured, while others are of such a price as not to be accessible to the student. It is certainly matter of much regret, that he should not possess the means of consulting such admirable illustrations of anatomy, and such beautiful specimens of the graphical art, as the works of ALBINUS, SOEMMERING, HUNTER, SCARPA, Sir A. COOPER, CALDANI, and others.

To obviate, in some measure, this great defect in the education of the anatomical student,—to supply the medical practitioner with mementoes and illustrations of some of the more important parts of the human body, with which he ought to be peculiarly conversant, in performing various chirurgical operations, is the object of the present work; and it shall be the business of Part II. to supply him who practises Midwifery, with such views of the Female Pelvis as may assist him in the prosecution of his more immediate province. Even to him who is purely a Physician, the study of the Bowels of the Pelvis, and of its proper Bloodvessels and Nerves, is peculiarly interesting. He is often called upon to relieve disorders peculiar to these important organs, or others proceeding from the remarkable degree of sympathy between these and the bowels of the abdomen.

How frequently, for instance, is a severe fit of colic the only mark of a stone in the kidney; or pain and difficulty in making water, the first symptom of scirrhous rectum; or how often does an inflammation in the intestines begin, like that same disease of the kidney, by acute pain in the loins.

On the other hand, pain of the testicle is, on many occasions, the earliest symptom of a derangement in the functions of the alimentary canal. Owing to the same primary disorder, pain is felt in the bladder, urethra, or perinæum, which has sometimes led to the erroneous idea of the patient being afflicted by stone in the bladder, or stricture of the urethra.

That these sympathetic symptoms are connected with a disordered state of the bowels, is evident from the relief which attention to diet, exercise, and the due administration of purgatives affords.

It is important for the physician to be acquainted with the effect which remedies applied to the Rectum have upon the Bladder of Urine and Womb; as, in some instances, the remedy thrown into a contiguous bowel has a more powerful effect than when applied to the more immediate seat of the disorder,—a circumstance strongly illustrated by the effect of opiate clysters, in stopping a bleeding from the womb,—in removing the very acute pain created by a cancerous ulcer of the uterus; or spasm in the neck of the bladder of urine, occasioned by a stone in that organ.

Of the subjoined Engravings, as specimens of anatomical illustration and graphical art, it would be indelicate for me to say more, than that, upon being frequently compared with nature, they appeared to me to be faithful portraits; and the public may perhaps be disposed to regard them with a favourable eye, from the names of the very distinguished artists affixed to them.

Fig. I. of Plate IV. is a copy from one of the justly celebrated engravings of the Pelvis which have been published by the celebrated Dr Peter Camper. I have selected this figure, not only because it affords an excellent illustration of the distribution of the Arteries, Veins, and Nerves of the Pelvis, but also of the mode in which the Spermatic Cord enters the Inguinal Canal.

Plate VII. is a copy from one of the splendid, beautiful, and faithful Engravings of Hernia, which accompany the Treatise of Scarpa upon that subject. It affords a very striking portrait of the distribution of the vessels on the outer side of the Pelvis, and also of those proper to the upper part of the Thigh. It exhibits also a very good view of one of the varieties of Crural Hernia.

To some the large size of the Engravings may be an objection; but this is probably one of their greatest merits, and more than compensated, by their greater utility to the practical surgeon, and greater clearness of illustration. The Surgeon, when about to perform lithotomy, or the operation for inguinal hernia, wishes to have an exact knowledge of the disposition of the muscles, bloodvessels, and nerves, in respect to the bones of the Pelvis: the Accoucheur must know the proportional size of the child's head, and apertures of the Pelvis, in order to form a just prognosis, and to accommodate his mode of treatment to the peculiar circumstances of the case. If further arguments, in favour of size, were necessary, it might be added, that the Plates of Hunter, Smellie, Camper, Walter, Scarpa, Caldani and Sir A. Cooper, are also as large as nature.

With regard to the corresponding Letter-press, it seems requisite to add a few words.

It is not a mere meagre explanation of the numbers affixed to the engravings, but explains somewhat of the mode of dissecting these parts, of their uses, their diseases, and the mode of relieving these by chirurgical operations; in short, it has been constructed upon the same plan as that which accompanied the Fasciculus of Engravings of the Bowels of the Chest and Belly, which has already met with the sanction of the public; so that this Fasciculus may be consulted by itself, or along with any other author on Anatomy or Surgery.

GENERAL REMARKS ON THE PELVIS.

THE Pelvis is composed of hard and soft parts (Vide Plates I. II. and III.), the former of which form a strong ring of bone around the lower part of the trunk of the body. The bones composing the parietes of the Pelvis are strong, flat, and irregular in form, and are firmly united to each other by muscles, tendons, and several strong ligaments. There is no part of the skeleton which varies so much as to its dimensions and form, even in persons of the same age, sex, and nation. Besides, it often happens, even in persons in other respects well made and robust, and to all appearance in perfect health, that the opposite sides of the Pelvis are dissimilar. (Vide Plates V. and VI.) The larger bones of the Pelvis, on account of their irregular form and want of resemblance to any familiar figure, have been called Ossa Innominata. These large bones form the sides and front of the Pelvis, and each being arched forwards, they meet in front; and, by their union, form what has been called the Symphysis Pubis. (Vide Plate I. Nos. 2, 4.)

The back part of the Pelvis is formed by the Os Sacrum, and Ossa Coccygis. A part of the os sacrum is seen, Plate I. No. 3.

The Ossa Coccygis (No. 4.) are fixed to the lower and smaller extremity of the os sacrum, and are appendages to that bone: they are so situated as to give a certain degree of support to the intestinum rectum, and, when drawn backwards, the lower aperture of the Pelvis is thereby increased.

The mechanical disposition of the component bones of the Pelvis is admirably constructed for supporting the superincumbent weight.

The Os Sacrum, which is somewhat triangular in shape, having the longest side of the triangle uppermost, is firmly wedged in between the ossa innominata; and, when depressed by the weight of the body, it forces together the ossa innominata at the symphysis pubis, marked by Nos. 2, 2, and renders the bond of union between them still more intimate.

A certain proportion of ligament enters into the construction of the Pelvis; thus sufficient space is given for the origin and insertion of the requisite number of muscles; the weight is not increased, and the bad effects of shocks which the body otherwise must have sustained whilst violently agitated, as in dancing, leaping, running, or descending from a height, are averted.

The Pelvis has been divided into three parts, the Brim or Introitus, the Cavity, and the Inferior Aperture or Exitus.

The true or lower Pelvis has been said to be composed of a cavity, and of an upper and under aperture.

The line extending backwards from the ossa pubis to the ossa ilia, is the line which marks the upper aperture of the true Pelvis, which looks upwards and forwards in the erect position; but the inferior aperture, which is much contracted by muscles, and by ligaments extended between the os sacrum, ossa coccygis, and ossa ischia, called therefore Sacro-sciatic, looks downwards and backwards.

The Pelvis merits peculiar attention,

1. As being a firm basis on which the bones of the trunk are moved, and also those of the inferior extremities:

2. As a cavity for the lodgment and defence of the organs of urine and generation; a part of the intestines; and the bloodvessels, nerves, and glands proper to these; and for the muscles which assist in discharging the contents of the included bowels:

3. As giving passage to the fœtus;

4. As its parietes and included bowels are liable to many organic derangements, several of which may be relieved by the art of surgery; and,

5. As the Pelvis, by the magnitude and arrangement of its several parts, has a reference to our erect position.

OF THE DISSECTION OF THE PERINÆUM OF THE MALE, AND OF THE MUSCLES CONNECTED WITH IT.

THE body of the subject is to be placed with the lower extremities bent, and the knees drawn upwards, as when the surgeon is about to perform the lateral operation of lithotomy, whilst an assistant raises and holds up the scrotum. The common integuments are to be divided from the anterior verge of the anus to the root of the scrotum, by which a fascia of a tendinous nature is exposed.

In some subjects, there is so much fat under the skin, that when it has been divided, as in performing the lateral operation for lithotomy, the opposite sides fall together, and prevent the surgeon from seeing the deeper parts.

On removing the skin and fat over the perinæum, a strong tendinous fascia comes into view, which is fixed to the ossa ischia and pubis, and also, to the tendinous aponeurosis of the muscles of the thigh, and which is loosely connected with the cellular substance of the scrotum.

This fascia prevents the escape of matter formed here, and also the effusion of urine, when the urethra has been ruptured: hence, when the urine has escaped, and has formed a swelling in the perinæum, the liquid passes upwards to the scrotum, which being of a loose texture, yields before the effused fluid, occasioning a considerable swelling, and which at length bursts.

The dissection of the muscles of the perinæum is to be conducted in the following manner:

A semicircular cut is to be made on each side of the anus, which should meet at the posterior part of it, from which an incision is to be continued to the extremity of the ossa coccygis. This dissection is to be continued, carrying the knife sometimes backwards and sometimes forwards, so as to expose one-half of the cutaneous sphyncter ani, and the acceleratores urinæ.

One-half of the cutaneous sphyncter is to be raised from the fat as far as the verge of the anus. This loose half of the sphyncter is to be held firmly towards the other half of the internal sphyncter, till it be cleaned by raising the fat.

From the posterior extremity of the accelerator urinæ, an incision is to be made transversely, so as to expose the transversalis perinæi, and a part of the levator ani.

An incision is to be made at the side of the os ischium, to expose the crus penis covered by its erector muscle.

The acceleratores urinæ are exposed, by dividing the skin over the raphe; and, in order to shew the levator ani, it is requisite to remove a good deal of fat which covers it, and afterwards to dissect its origins from the inner side of the Pelvis.

There is a quantity of loose cellular substance between the muscles of the perinæum. This is no unfrequent seat of abscess; and if the matter be not discharged, it may spread among the muscles of the perinæum to a considerable extent. In the same manner, urine that has been effused in consequence of rupture of the urethra, or after the operation of lithotomy, often becomes a cause of inflammation of the cellular substance in the perinæum, which, being communicated to the peritonæum, sometimes proves the cause of death. To prevent the effusion of urine after the lateral operation of lithotomy, Mr Liston has recommended the introduction of a tube into the bladder, as a conduit for the urine.

PLATE I.

THE object of this Plate is to give a representation of the Under Aperture of the Pelvis of a well formed Female, which has been placed in the same position as that of a woman during labour, or of a man during the performance of the lateral operation of lithotomy. The drawing was taken from the body whilst it was recent, in order that the form and size of the Pelvis might be more faithfully represented, and before the ligaments or connecting cartilages of the Pelvis had shrunk, in consequence of having been in part dried.

The upper part of the inferior aperture, formed by the conjoined ossa pubis, forms what has been called the *Pubic Arch*, which in the male is an acute, and in the female an obtuse, angle. (Vide Plate I. No. 2.) (Vide Fig. 4. of Plate V.)

No. 5, 5, point out the descending Rami of the Ossa Pubis, and the ascending Rami of the Ossa Ischia; and

No. 3. points out a part of the Os Sacrum, covered by its ligamentous fibres following different directions. The pubic arch is, in the recent body, filled up by the organs of generation.

Nos. 6, 6, the Tuberosities of the Ossa Ischia.

No. 7. points out the Ligaments which connect the Os Sacrum with the Os Innominatum; and

No. 8. the Crural Arch, which extends between the anterior and superior spinous process of the Os Ilium, the Symphysis Pubis, and the anterior part of the Linea Ilio-pectinea, the broader part of which, No. 9., having been more particularly described by GIMBERNAT, has, by some authors, been called Gimbernat's Ligament, and by others the third insertion of the external oblique muscle of the abdomen. Many years ago I remarked, that this part of the crural arch is always considerably broader in the male than in the female; and hence the greater size of the crural aperture in women; and owing to this peculiarity of structure, they are more liable to suffer from crural hernia than men *.

No. 10. points out a portion of the strong capsular Ligament which unites the surfaces of the Ossa Pubis, which are in contact at the interior of the symphysis pubis, from which there is, on each side, a round and strong ligament, which descends to the tuberosities of the ischia; and between the ossa pubis there is a ligamento-cartilaginous substance, composed of fibres passing in a transverse direction, or sometimes two cartilaginous substances, broader in the female than in the male.

The obturator foramen is filled up by a Ligament, marked No. 11., in which there is a large aperture for the obturator artery and nerve, and three other small apertures, from which small branches of the obturator artery, vein and nerve, pass outwards, and get into the acetabulum, to supply the synovial apparatus within the hip-joint.

The most important ligaments of the Pelvis (Vide Nos. 12, 12, 12,) are two strong Ligaments, of unequal size, situated at the under aperture of the Pelvis, and which have been called, on account of their situation, Sacro-sciatic, as they are placed between the os sacrum and os ischium. The longer arises from the back of the crest of the os ilium, from the transverse process of the os sacrum, from the back part of the same bone, and also from the ossa coccygis, and is fixed to the ligament which covers the tuberosity of the os ischium.

That portion of this ligament which is attached to the back part of the spine of the os ilium, being thinner than the other portions of the same ligament, has been called its membranous part, or Appendix; and the inferior portion of the same ligament, which descends in the form of a sickle, along the inner part of the tuber ischii, with its concavity looking inwards, and with its narrow end directed upwards, towards the descending ramus of the pubis, has been called, on account of its shape, the Falciform Process of the sacro-sciatic ligament. (Vide No. 13. 13.)

The shorter sacro-sciatic ligament takes its origin from the side of the os sacrum and ossa coccygis, and is fixed to the spine of the ischium.

The muscle called Obturator internus passes between the sacro-sciatic ligaments.

The capsular Ligament of the Hip-joint, No. 14. is connected with the margin of the acetabulum, and descending, is fixed into the prominent line of the thigh-bone, which extends between the trochanter major and minor, so as to include not only the head, but also the neck of the thigh-bone, and descends lower upon the anterior than on the posterior part of the neck of the bone. This ligament is reflected inwards, towards the head of the bone.

The capsular ligament is not of an uniform thickness; it is thicker at its upper and back part than elsewhere, and is strengthened, on its fore-part, by a band of ligamentous fibres, which arise between the two origins of the rectus extensor cruris; and behind there is also an accessory band of ligamentous fibres.

* See Observations on Crural Hernia. Edinburgh 1803.

The capsular ligament is strengthened in front by the psoas and iliacus internus and rectus cruris muscles; internally, by the obturator externus and pectineus muscles; behind, by the gemini, the pyramidales, and the tendon of the obturator internus: above, by the gluteus minimus muscle.

The Acetabulum, No. 15., is lined by cartilage; as also the head of the thigh-bone. These articular cartilages are of unequal thickness, the former being thinnest towards the centre of the joint; whereas the corresponding portion of the latter is thicker than in any other part, in order to render the joint deeper, and at the same time stronger.

There is a Ligament, No. 16., within this joint, somewhat of a triangular shape, which consists of two parts; one of these is fixed to the under and inner part of the acetabulum, and is connected to the substance called formerly the Gland of the joint, from which it becomes gradually narrower; and the other is fixed to the notch in the acetabulum. These parts are united and inserted into the pit, upon the inner surface of the ball of the thigh-bone, No. 17. This ligament gives great additional security to the joint; it prevents the displacement of the head of the thigh-bone. In a case in which there was thickening and erosion of the articular cartilages, and also slight erosion of the brim of the acetabulum, this internal ligament, together with the synovial apparatus, was completely destroyed.

A double Cartilago-ligamentous Membrane, No. 18. is stretched across the breach in the inner and fore part of the acetabulum; in the posterior part of which there is an aperture for lodging a part of the synovial apparatus.

The bony margin of the acetabulum is encircled by a ligament, which adds considerably to its depth, and is called the Cotyloid ligament.

Owing to the greater shortness of the capsular ligament of the hip-joint, and the greater depth and immobility of the acetabulum, the movements of the thigh-bone are much more circumscribed than those of the os humeri.

The ligamentous fibres which pass from the anterior and superior, and anterior and inferior spinous processes of the os ilium, prevent the thigh-bone from being carried backward, beyond a perpendicular line drawn from the Pelvis downwards.

No. 19. marks the Ball of the Thigh-bone, after it has been removed from its natural socket the acetabulum.

No. 20. points out the length and direction of the Neck of the Thigh-bone.

No. 21. marks the Trochanter Major of the Thigh-bone.

No. 22. points out the Body of the Thigh-bone.

The greater size of the under aperture of the Female Pelvis is very conspicuous in this view. The relative proportions between the under apertures of the Male and Female Pelvis are given in a subsequent Engraving, Fig. 4. Plate V.; and Fig. 2. Plates V. and VI. point out a very common distortion of the Pelvis, of which sufficient notice has not been taken by authors.

Even when there is not the slightest degree of distortion of the under aperture of the Pelvis, urinary concretions sometimes attain so large a size, that it is impossible to extract them by the lateral operation of lithotomy. In these circumstances, recourse must be had to the cutting into the bladder of urine above the ossa pubis.

PLATE II.

IN this Engraving, a representation is given of the Muscles of the Perinæum, after having removed the skin, fat, and cellular substance. The Intestinum Rectum, after having been moderately distended, has been pulled a little towards the right side, and a staff has been passed into the Urethra. From what is seen as to the effect of the distention of the intestinum rectum, in this Plate, it is obvious, that, before performing the operation of lithotomy, it is prudent to give a purgative to empty this bowel, lest it be cut during the operation.

No. 1, 1, 1, 1, are placed upon the Thighs;

Nos. 2, 3, and 4. the Buttocks;

Nos. 5. and 6. the Tuberosities of the Ischia;

Nos. 8. and 9. point out the Scrotum, covered by a few hairs;

No. 10. The Urethra, filled and distended by the Staff; and,

Nos. 11. and 12. The Crura of the Penis, diverging somewhat like the strokes of the letter V, and terminating in two small rounded bodies, each of which is united by ligamentous fibres to the ascending branch of the Ischium. The Crura Penis are in part covered by

Nos. 13. and 14., the muscles called the Erectores Penis, and their flat tendons. The fibres of these muscles are oblique; they pass upwards and forwards in the figure. These muscles are fixed by flat tendons into the ligamentous membrane of the Corpora cavernosa penis, where they are united to each other. When the penis is erected, these muscles tend to draw the crura penis downwards, and towards the tubera ischii.

No. 17. points out the Belly of the Sphyncter Ani muscle. This muscle is oval-shaped, and is placed immediately beneath the skin. It arises from the point of the Os Coccygis, marked by No. 7.,—and its anterior insertion is marked by No. 18.

This muscle may be called semivoluntary, that is, it contracts so as to close the anus and retain the fæces, without our being conscious of it, and that contraction is independent of the will; but at pleasure, by means of the muscles of the abdomen, we can overcome the resistance of this muscle. There exists a balance between the action of the longitudinal muscular fibres of the rectum, and the sphyncter ani; hence, when that balance is destroyed, a prolapse of the rectum follows. (Vide Plate VI.)

So great is the relaxation of this muscle in some weakly children, that a prolapse takes place, without pain or violent exertion, every time the child goes to stool, and the prolapse may be readily returned by slight pressure.

Nos. 19. and 20. are affixed upon the lower, narrow, funnel-shaped muscles, the Levatores Ani, which form a sort of tape or swath about the intestinum rectum. These muscles are also attached by their extremities to the sides of the Pelvis, and the bulb of the Urethra. The levatores ani, besides surrounding the rectum, include the lower part of the rectum, the vesiculæ seminales and prostate gland, and in women also the vagina.

The anterior fibres of the levator ani, which are disposed somewhat like the sticks of a fan, descend, and cover the membranous part of the urethra, and are fixed below to the anterior part of the sphyncter ani: those which take their rise from the inner part of the symphysis pubis descend obliquely forwards, and are somewhat elevated by the prostate gland, which they cover, and a portion of the muscle is fixed to the triangular ligament of the urethra.

The levatores ani and coccygei muscles form the lower part of the abdomen, support the hollow bowels included within the abdomen and pelvis, during the violent action of the diaphragm, as in coughing and sneezing, as may be felt by putting the palm of the hand on the perinæum. By means of the diaphragm and levatores ani, the perpendicular diameter of the abdomen is enlarged or contracted.

The most remarkable degree of contraction takes place in the effort of expelling hardened fæces; and, on the other hand, the abdomen is enlarged to the greatest degree, during violent expiration, as in sneezing or coughing, and it is to be taken into account, that the diaphragm has a more powerful effect in producing either of these states than the levatores ani and coccygei muscles.

No. 21. marks the place of the Transversalis Perinæi, which, in this instance, should rather be called Obliquus Perinæi, on account of the oblique direction of its muscular fibres. There was no Transversalis Perinæi Alter in the subject from which the drawing was taken.

Nos. 22. and 23. point out portions of the Gluteus maximus.

As a corollary to the preceding description of the muscles of the Perinæum, it may not be improper to add a few words respecting the mode of performing the lateral operation of Lithotomy.

The incision should be made half way between the anus and tuberosity of the os ischium; so that, at its upper part, it may be opposite to the anterior insertion of the sphyncter ani muscle (Vide No. 18. Plate II.); and so that it may fall in upon the side of the corpus spongiosum urethræ and bulb of the urethra, and into that triangular space between the bulb and the crus penis; and it should extend nearly four inches.

By this procedure, there is little risk of injuring the bulb of the urethra, or the trunk of the pudendal artery; and sufficient space is given for the extracting a stone which exceeds the average size: an incision of such a length supersedes the necessity of enlarging the external incision, renders it easy to extract the stone, and prevents the parts from being bruised or torn by the forceps, which frequently proves a cause of death.

The first incision, the object of which is to divide the skin, fat, cellular substance, and tendinous membrane of the perinæum, should be made in the axis of the Pelvis: by the next, the transversalis, and levator ani muscles are to be divided; and, in the same direction, and during the time the incision is made, the bulb should be pressed to one side, lest it be injured.

Before dividing the above muscles, it is prudent, by the fore finger of the left hand, to press down the rectum, lest it be cut.

Upon the above muscles being divided, the groove of the staff within the membranous part of the urethra may be felt by the finger. This may be readily divided by a short-bladed knife, the edge of which is to be directed upwards, and the cut in the membranous part is then to be extended backwards towards the prostate gland, in the same direction. For the lateral division of the prostate gland and neck of the bladder, I have exhibited in my surgical lectures, for several years past, a scalpel, with a small button on its back, which fits into the groove of the staff, and slips along it into the bladder. The implanting this button or beak of the gorget (if it be used) into the groove of the staff, and keeping it there, is the most difficult part of the operation. To be certain that the button on the back of the knife is in the groove of the staff, it is well to move it up and down; for, if it be not in the groove, it may pass sideways between the bladder and rectum. The surgeon must be careful that the button does not slip out of the groove into the cellular substance between the bladder and rectum, owing to the unskilfulness of the assistant, who may change the direction of the instrument, or the unsteadiness of the patient, or the resistance of the prostate gland and neck of the bladder; for in such a case, the surgeon, supposing he had got into the bladder, might enter his forceps, and pinch and bruise the still undivided coats of the bladder.

To prevent the possibility of this very untoward circumstance, the button of the gorget invented by my Father is of such a form, that if it has been once inserted into the groove of the staff, in the membranous part of the urethra, it cannot get out of it, (unless it be broken off), until it is within the bladder.

Upon the bladder being divided, the forceps should be passed into it with their blades shut, in order that the situation of the stone may be discovered. This being accomplished, the blades are to be separated, the stone is to be grasped, and then withdrawn in the axis of the Pelvis, taking care to pull somewhat downwards, as otherwise the exit of the stone may be impeded by the arch of the pubis and the triangular ligament of the urethra.

PLATE III.

THIS Plate gives a lateral view of the Bowels of the Pelvis of an adult Male, the greater part of one of the ossa innominata having been previously removed.

No. 1. is affixed upon the Sacro-Iliac Symphysis;

No. 2. upon a part of one of the Ossa Pubis;

Nos. 3. and 4. upon one of the Hips and Thighs; and

No. 6. shews a portion of the Levator Ani muscle.

No. 7. points out that portion of the Levator Ani which covered the Prostate Gland, which latter is distinguished by No. 19.

No. 8. points out portions of the Levator Ani muscle, which has been turned downwards, to expose the intestinum rectum.

No. 9. points out the Muscle discovered and described by Mr WILSON, late teacher of Anatomy in London. (Medico-Chirurg. Trans. of London, Vol. I.)

No. 10. points out one of the Crura Penis, covered by its dense and elastic serous membrane.

No. 11. is affixed upon the Suspensory Ligament of the Penis, which takes its origin from, and is inserted into, the Corpora Cavernosa Penis.

Nos. 12. and 13. which point out a portion of that elastic canal called the Urethra, into which a staff had been previously introduced.

Much pains have been taken by anatomists and surgeons to ascertain the precise course and diameter of different parts of the Urethra, by filling it with melted wax, or by passing through it wax or leaden probes, and adapting these to its curvatures; but the object in view has not been obtained; of which the very different forms given by different surgeons to metallic sounds and bougies are sufficient evidence.

To me it seems probable, that, considering the elastic nature of the membrane of the Urethra, and the compressibility of the contiguous parts, the exact course and size of the Urethra cannot be ascertained.

For examining the bladder of a patient, supposed to be afflicted with stone, sounds of different lengths and shapes are required: they must be varied according to the position of the stone: some must be much bent, to reach the higher part of the bladder; while others should be more nearly straight, to touch a stone imbedded anterior to the prostate gland. For sounding the bladder, a catheter, made of steel, as recommended by my Father, is a good instrument; for when the bladder is empty, the stone may then be more readily discovered.

No. 13. points out the bulb of the Urethra.

No. 14. is affixed upon a section of one of the Crura Penis. The orifices of the cut vessels proper to that part of the body are exhibited.

No. 15. points out the Bladder of Urine, which has been only moderately distended by urine.

The fundus, or uppermost part of the bladder, has ascended only a little above the ossa pubis; but when the bladder has been still more distended, an incision or puncture may be readily made into that organ, above the ossa pubis, and exterior to the peritonæum.

The muscular fibres of the bladder are of a pale colour, and are not of an uniform size; those on the fore-part of this organ being smaller than those at its sides.

The greater number of the external muscular fibres are disposed in a longitudinal direction; the internal stratum follows a serpentine course towards the fundus of the bladder.

In my Elements of Anatomy, the very intricate course of these fibres has been fully described; the dissection of which, as WALTER observes, in the Preface to his Engravings of the Nerves of the Thorax and Abdomen, *opus est non unius diei.*

No. 16. is affixed to the posterior part of the Ilio-Vesical Fascia, and No. 17. upon the anterior part of the same fascia, which is seen and marked by Fig. 18. descending upon the rectum.

No. 19. is affixed upon one of the lateral lobes of the Prostate Gland.

No. 20. is affixed upon one of the Vesiculæ Seminales, the length and breadth of which vary in different individuals. The tendinous membrane which covered it is seen turned to one side.

This Plate gives a good view of the oblique situation of one of the vesiculæ, covered by fat, and a good deal of loose cellular substance. The outer membrane of the vesiculæ is of a pale colour, and has a shining surface, and the irregularities upon the surface catch the light, which gives the vesiculæ a shining appearance.

No. 21. points out one of the Vasa Deferentia, which communicates with the vesiculæ seminales of the same side.

The horizontal line points out the extremity of the anus, which is encircled by its proper muscle, the sphyncter ani.

From the relative situation of the rectum in respect to the bladder of urine, it follows, that a stone, lodged within the bladder, may be felt from the rectum ; and that the stone may be pushed upwards by the finger passed into the rectum, and may thereby be more readily caught by the forceps, after the bladder has been opened. Stones may also be extracted from the bladder by cutting into it from the rectum. This method of operating has lately been practised by Mr SANSON. He divides the sphyncter ani muscle from below upwards ; and opens the membranous part of the urethra, and the prostate gland, from above downwards.

This method of operating has been also of late repeatedly practised by the Italian surgeons, and especially by Dr VACCA BELINGHERI, who is a very warm advocate for it, and has published a memoir, in order to point out its peculiar advantages. According to that author, there are several advantages peculiar to this method of opening the bladder: " There is no point of the perinæum nearer to the bladder than that which is immediately anterior to the sphyncter ani. By cutting the sphyncter, the parietes of the rectum, the membranous part of the urethra, and the prostate, we shall have procured an opening sufficiently large for the entrance of our fingers, our forceps, and for the egress of the stone ; because we take advantage of the natural aperture of the anus, and cavity of the rectum."

Upon the preceding paragraph, it may be observed, that a passage, sufficiently large for the extraction of a stone of considerable size, may be obtained by the lateral operation. The late Mr A. WOOD extracted a stone, weighing 14 ounces, in presence of my Father, by the lateral operation; and his patient recovered. This stone is a great deal larger than the greater number of urinary calculi; the average weight of which does not exceed 2 or 3 ounces. The passage is too small only when the lateral operation has been unskilfully performed.

If the reader shall take the trouble of perusing what has been stated as to the prostate gland, he will be convinced, by DESCHAMP'S observations, that a stone, of very considerable diameter, may be extracted by the lateral method of operating ; and a very large stone may be extracted by the high operation ; whilst the patient is not exposed, by either of these operations, to the risk of a communication being established between the rectum and bladder of urine.

" An incision which divides the anterior part of the sphyncter ani, the membranous part of the urethra, in the middle line of its anterior (inferior) parietes, the neck of the bladder, the prostate and fundus of the bladder in the same line, does not approach any large vessel, or other part, important to life. The depth of the wound being less than by other methods, the surgeon is enabled to penetrate farther into the bladder, to ascertain the form, size, and situation of the stone, previous to his grasping it for extraction."

This observation is undoubtedly correct ; but the greater distance between the external parts and the bladder, is no objection to the lateral operation of lithotomy, as the inner surface of the bladder of the adult may be reached by the fore-finger of most operators, if the patient be not very fat.

By the recto-vesical operation, we are enabled to extract the largest stones, without the inconvenience of laying bare the peritonæum, and of exposing the surgeon to the risk of wounding it, or of the danger of extravasation of urine."

By this method of operating, no considerable artery is opened ; but the large veins, coming from the penis, which, on entering the Pelvis, form a plexus, which covers the prostate gland, may be wounded, and from these a good deal of blood may be lost.

In this view the course of the intestinum rectum is conspicuous. The form of the pipe of a clyster-bag should correspond with that of the rectum ; thereby the patient is less liable to injury when the injection is thrown up, and the injection passes upwards with greater certainty.

PLATE IV.

FIG. I. of this Plate is taken from the body of a child, at the period of birth, and is intended to give an idea of the Size, Form, and relative Situation of the Bowels of the Pelvis at that period of life.

No. 1. is affixed to a section of the Os Sacrum; and,

No. 2. points out the Rectum, the course of which in this Figure does not correspond with the sweep of the Os Sacrum, as it commonly does.

No. 3. is affixed to the extremity of the Rectum.

No. 4. points out the Bladder of Urine which had been opened to give an idea of its pyriform shape at this particular period of life; and, in this figure, the form of the Urethra is well seen. The figure is affixed to the termination of the urethra.

FIG. II. of this Plate is intended to exhibit the Size, Form, and Anastomoses of the Veins which lie between the bladder of urine and the rectum. The Figure was taken from the adult male.

No. 1. and 2. are affixed upon a section of the Os Sacrum and Ossa Coccygis.

No. 3. is affixed upon the Symphysis; and

No. 4. upon a section of one of the Crura Penis.

No. 5. points out the situation of the Intestinum Rectum: and a probe was introduced into the Anus at No. 6.

No. 8, 9, and 10. are the large Veins between the Intestinum Rectum and the Bladder of Urine.

It is proper to notice, that in the preparation from which this figure was taken, these large veins had been filled with wax, and their coats may perhaps have yielded to a certain extent, so that they appear somewhat larger on that account.

The knowledge of the great size and situation of these veins is of great moment to the surgeon, as they may be very readily wounded in puncturing the bladder from the intestinum rectum, or in cutting into the bladder from the rectum.

It also occurs to me, that the bleeding which often occurs after the lateral operation of lithotomy more frequently proceeds from these veins than from the branches of the pudic artery, as the prostate gland and neck of the bladder of urine are surrounded by them.

When the muscular fibres of the bladder have been much thickened, in consequence of an enlargement of the prostate gland, these veins also become much enlarged, and assume a tortuous course.

FIG. III. is a copy of the excellent Figure of Dr CAMPER, in which a correct view of the course of the Nerves and Bloodvessels of the Pelvis is given.

Nos. 1, 1. are affixed upon the Os Sacrum, which has been cut vertically.

No. 2. upon the Ossa Coccygis, 2 A upon the Symphysis Pubis.

No. 3. on one of the Crura Penis.

No. 4. upon one of the Sacro-Sciatic Ligaments, which is covered by the Coccygeus Muscle.

No. 6. points out the Obturator Internus Muscle.

No. 7. points out the Iliac Vein.

No. 8. the anterior Iliac Vein.

No. 9. the Epigastric Vein.

No. 10. the Obturator Vein.

No. 11. points out the Iliac Artery; and No. 10. is placed upon the Obturator Artery as well as its accompanying vein.

The obturator artery commonly arises from the posterior iliac artery; but sometimes takes its origin, in common with the epigastric artery, from the anterior iliac, and sometimes from the ischiatic artery.

The trunk common to the obturator and epigastric arteries, is sometimes a quarter of an inch in length; in other instances, it measures from an inch to an inch and a half, and I have met with it of all intermediate lengths.

If the common trunk be only a fourth of an inch long, the obturator artery runs on that side of the sac of the crural hernia, which is next to the anterior spinous process of the ilium, and cannot be displaced, being firmly bound down by cellular substance: it cannot, therefore, be injured in that kind of crural hernia, in which the displaced bowels are lodged within the sheath of the lymphatic vessels, by dividing that part of the crural arch next the pubes, in the manner recommended by Mr GIMBERNAT.

On the other hand, it frequently happens, when the obturator arises in common with the epigastric artery, that a third branch, nearly of equal size with the obturator, takes its rise from the common trunk. This may be called the Artery of the Internal Part of the Crural Arch; for it runs on the inner side of the crural arch, passes across GIMBERNAT'S Ligament, and, when it reaches the symphysis pubis, divides into a number of small branches which are distributed upon the inner side of the symphysis pubis.

When the trunk common to the obturator and epigastric arteries is an inch, or an inch and a half, in length, the obturator artery is situated between the symphysis pubis and the hernial sac, and sometimes follows the same course as that part of the crural arch called GIMBERNAT'S Ligament; of which arterial distribution I have seen several examples.

Mr JAMES WARDROP, was, I believe, the first who described such a distribution of arteries in the case of crural hernia. In the instance alluded to, the obturator artery arose from the same trunk as the epigastric artery; then passed on the pubal side of the neck of the hernial sac, and described a semicircle around the neck of the sac.

There is little risk of wounding the obturator artery, excepting when the trunk common to it and the epigastric, is an inch long, and when it follows the course of GIMBERNAT'S Ligament: hence that unusual deviation of the obturator artery from its ordinary course, does not form so strong an objection to GIMBERNAT'S operation for crural hernia as has been stated.

There is still another variety as to the distribution of the epigastric and obturator arteries. These arteries in some cases come off from the anterior iliac artery by separate trunks; and the obturator artery passes around that part of the crural arch called GIMBERNAT'S Ligament, and is attached to it by cellular substance. When this happens, the obturator artery, by the descent of a portion of the intestine through the crural ring, is pressed upon the very part of the crural arch divided by GIMBERNAT in his operation for crural hernia.

In some cases I have seen the obturator artery sent off from the external iliac artery, about an inch and a-half above, and in others, about an inch below, the epigastric artery. In still other instances, the obturator arises from the superficial femoral artery; and ascends along the pectineus muscle, entering the Pelvis at the crural aperture. The artery in this case is placed behind the crural hernia.

I have seen, in one instance, two obturator arteries, the one of which took its rise from the hypogastric artery, and the other arose from a trunk which was common to it and the epigastric, and both obturator arteries were united before passing through the foramen obturatorium.

I have thus made particular mention of all the varieties as to the origin of the obturator arteries which have fallen under my observation, as these arteries are of considerable size, and, when divided in the time of performing the operation for crural hernia, have sometimes poured out so much blood as to prove fatal; for, on account of their deep situation and retraction, it is very difficult to secure these vessels by ligature.

The obturator artery gives branches to the levator ani, iliacus internus and psoas muscles: frequently there is a branch which passes across the symphysis pubis, and which anastomoses with a branch of that artery of the opposite side.

No. 12. is affixed upon the external Pudic Artery; and

No. 13. points out its branches.

No. 14. is placed upon the left common Iliac Artery.

No. 15. marks the Obturator Nerve; and

Nos. 16. and 17. the Pudic Nerves, which send branches to the obturator muscle and muscles of the anus.

No. 18. points out the common Iliac Vein.

WR Axis Pelvis.

UV, according to CAMPER, is the 'Linea propensionis horizonti parallela, dum superne decumbimus: perpendicularis vero, dum erecti pedibus insistimus.'

The four uppermost Sacral Nerves are also seen in this figure, which unite with last Lumbar Nerves.

PLATE V.

In this Plate Four Figures are given.

Fig. I. gives a lateral view of the fore part of the Pelvis, in order to shew the Anterior Ligament of the Bladder of Urine, and the origin of the Muscular Fibres of that organ.

No. 1. is affixed upon a part of the Bladder of Urine.

No. 2. upon a section which was made at the Symphysis Pubis.

No. 3. points out one of the Crura Penis.

No. 4. the Bulb of the Urethra.

No. 5. Cowper's Glands, which are not always present.

No. 7. points out the origin of the Muscular Fibres of the Bladder of Urine; and

No. 8. a section of the large Veins, which pass through a cribriform membrane, at the side of the anterior ligament of the Bladder of Urine.

Fig. II. This Figure points out several peculiarities with regard to the Pelvis, which occurred in the body of a remarkably stout and athletic man, who, in all other respects, was remarkable for the symmetry of his bodily form.

In this remarkable case, the Pelvis was considerably distorted; the arch of the pubis had not its usual form and breadth; the ascending ramus of the ischium of one side was straighter than that of the other, and the one tuberosity of the ischium was lower down than the other.

The under aperture of the Pelvis, in this otherwise well formed man, is so much contracted, that there was not sufficient room to have performed the lateral operation of lithotomy.

No. 1. is affixed upon the descending ramus of the Os Pubis, and ascending ramus of the Ischium of one side; and

No. 2. and 3. upon the corresponding Bones of the opposite side.

No. 5. and 6. are affixed upon the Crura Penis, the origin of one of which is much higher than that of the other.

The Crura Penis are marked by the Nos. 4, 5, 6.

No. 7. is affixed upon the Urethra, into which a sound had been passed.

No. 8. points out the Bulb of the Urethra, which was covered by a number of glandular looking bodies, of the same size as in the Figure.

No. 9. is affixed upon the Bladder of Urine.

Fig. III. represents an oblique view of the Pelvis, so as to represent the relative situation of its component Bones, and Bloodvessels and Nerves.

No. 1. is affixed upon the ascending Ramus of the Ischium, and upon the Tuberosity of the Ischium.

No. 3. points out the place of the exit of the Pudic Nerves from the Pelvis, upon the ramifications of which there are small dots; and the Trunk and Branches of the corresponding pudic arteries are coloured red.

The pudic artery is derived from the hypogastric, or from the ischiatic artery. It passes between the pyriform muscle and the posterior part of the levator ani muscle, and then through the under part of the great sciatic notch, and between the sacro-sciatic ligaments to the spine of the ischium. The artery then runs towards the inner surface of the tuberosity of the ischium, to which it is fixed by the tendinous aponeurosis of the obturator internus muscle, and advances along the inner side of the ascending ramus of the ischium, behind the transversalis muscle and crus penis. In the above course, there are several small branches sent off, which supply the bladder of urine, vesiculæ seminales, the obturator internus muscle, the pyriform and glutei maximi muscles, and form the external hæmorrhoidal branches. Branches of the same artery pass to the origins of the triceps adductor femoris and semitendinosus muscles.

The following branches are sent off from the ascending branch of the pudic artery.

1. The *Perineal Artery* ascends between the accelerator urinæ and erector muscles, supplying with blood the fatty muscles, skin of the perinæum, and scrotum.

2. The *Profunda Penis*, which is placed under the transversalis perinæi. It is fixed to the ascending branch of the ischium, and having reached the symphysis pubis, where the corpora cavernosa penis are united, it is subdivided into two great branches, one of which passes along the dorsum of the penis, through the whole length of that organ, immediately beneath the skin; and, in that course, it is subdivided into a great many small branches, which are distributed on the corpora cavernosa penis, and on the glans penis.

The deeper branch of this artery subdivides into the arteries proper to the corpora cavernosa penis, and corpus spongiosum urethræ; and those of opposite sides inosculate with each other through the septum penis.

Compression is not to be relied upon after the penis has been amputated; the ligature is indispensable. Mr HEY has pointed out the necessity of securing the several arteries of the penis by the ligature, and has also strongly recommended the encircling the sound part of the penis by a broad piece of tape; it forms a useful kind of tourniquet during the operation, and prevents the loss of blood while the surgeon is engaged in putting his ligatures upon the divided vessels.

It is not necessary to pass a tube into the urethra. I have seen cases terminate well without it. All that is necessary is occasionally to pass a bougie.

Mr A. BURNS shewed me two specimens, in which the pudic artery, instead of passing out of the pelvis between the sacro-sciatic ligaments, passed along the lateral and inferior part of the bladder, and traversed the upper part of the prostate gland, in its course to the ramus of the os ischium.

I have not seen, on any occasion, such a considerable quantity of blood lost during the lateral operation of lithotomy, as was at all dangerous. The bleeding proceeds from cutting into the bulb, by which that branch of the pudic artery which is proper to the bulb is divided, and the large trunk proper to the corpus cavernosum. In the Female, a branch of this artery is sent between the sphyncter vaginæ and erector clitoridis to the body of the clitoris.

No. 8. points out a pair of Forceps introduced into the Anus.

FIG. IV. is intended to communicate to the reader a view of the corresponding angles of the Pubes of the Male and Female Pelvis; the angle of the former of which is much sharper than that of the latter.

In my Elements of Anatomy, Vol. I. measurements have been given of the Pelvis of the Male and Female, to which I beg to refer the reader. According to SŒMMERING, in the Male the angle of the Ossa Pubis is between 60° and 80°, and in the Female it is equal to 90°.

The student should direct his attention, in an especial manner, to the angle formed by the ossa pubis, so as to calculate the space which a small-sized pair of forceps, with a small stone between the blades, would occupy; by which, it is evident, that there is not sufficient space for the forceps and stone, if the incision be made in the skin and muscles too high up, or in the upper part of the arch of the ossa pubis.

The uppermost part of the incision should not be higher than the anterior insertion of the sphyncter ani muscle, marked by No. 18. Plate II.

PLATE VI.

THE object of this Plate is to shew Distortion of the Pelvis, the effect of a Prolapsus Ani, and the Muscles, Bloodvessels and Nerves of the Perinæum.

No. 1. shews the Penis turned backward.

No. 2. and 3. the Testes.

No. 4. the Urethra.

No. 5. and 6. the tuberosities of the Os Ischium, which are not on the same level, nor placed in the same direction, the one being placed much more obliquely than the other.

No. 7. is affixed upon the Sphyncter Ani muscle.

No. 8. is applied upon the Acceleratores Urinæ ; and,

No. 9. upon the Levator Ani.

At No. 10. one of the Crura Penis had been removed to shew more fully the course of the Pudic Artery.

No. 12. points out the Pudic Nerves. On the right side, and on the left side, the Pudic Arteries are represented : the corresponding Vein and Nerves have been previously removed, in order that the size and different branches of the Pudic Artery might be more distinctly seen. From the view given in this Engraving, it is obvious, that the main trunk of the Pudic Artery is well protected by the Os Ischium, and that it is not in danger of being opened during the performance of the lateral operation of Lithotomy.

The descending branches which supply the Levator Ani Muscle, and the skin and fat around the anus, must necessarily be divided ; but they are of so small a size, that but a small quantity of blood will be discharged from them.

The branch of the Pudic Artery which enters the bulb of the Urethra is of much greater size, and if divided, a good deal of blood will be discharged from it. If the gorget be employed for performing lithotomy, the deeper and internal Pudic Arteries may be also divided ; but if the knife be used, these may be avoided.

In this figure, the effect of a *Prolapsus Ani* is also shewn. In consequence of the prolapse, the Intestinum Rectum has been very much distended ; therefore, if the lateral operation of lithotomy had been performed, that bowel would have been very liable to be wounded.

I am fully aware, that wounds inflicted upon the Rectum do not invariably prove fatal, for many have recovered who had sustained this injury ; but the wound in the Rectum is not necessary ; and by it, the patient is exposed to much inconvenience, and in some cases to loss of life. Children afflicted by Stone, are frequently afflicted by a prolapse of the bowels ; and as the intestine, during the operation of the lateral operation of lithotomy, may, from the exertion of the patient, be prolapsed even to a greater degree than is represented in the engraving, consequently the Intestinum Rectum will be still farther distended, and the bowel become thereby still more liable to be injured during the performance of the lateral operation of lithotomy.

From this figure, it follows, that, if the Intestinum Rectum be divided as in the operation for the *Fistula in ano*, at the depth of three or four inches from the anus, a considerable branch of the Pudic Artery may be divided ; and that, by such an operation, the Inferior Mesenteric Artery may also be wounded.

No. 13. the prolapsed Bowels. In consequence of a violent exertion of the patient, a great portion of intestine may be pushed down, and strangulated. From the strangulation being succeeded by an obstruction to the passage of the fæces, inflammation and gangrene of the intestines will follow. The prolapsed portion of Intestine may, during infancy and old age, be readily reduced ; but in the prime of life, when the parts are much swollen, there is a greater tendency to inflammation. The topical detraction of blood, or even general bleeding, is necessary, and warm fomentations, before the prolapsed part can be returned. When the reduction of the prolapsed portion of Intestine has been too long delayed, and the tumour is inflamed and painful, the same symptoms as those of a strangulated Hernia comes on.

The cause of the constriction is the spasmodic contraction of the Sphyncter Ani Muscle.

CALLISEN, one of the most distinguished surgeons, has observed, that if the disease does not yield to the above mentioned remedies, and if the symptoms be very urgent, *locus specialis maximæ stricturæ stylo flexili explore-*

tur, et aut scalpello ad specillum sulcatum ducto, aut cultro lamina abscondita, incidendus, et strictura solvenda erit *. On account of the relaxation and weakness that follow the operation, astringent clysters, composed of the decoction of bark with alum, are of considerable benefit; and alse a T bandage, with a sponge adapted to it, so as to compress and retain the bowel.

Even supposing that the prolapsed bowel does not become strangulated in consequence of being exposed, it becomes thickened and indurated, and almost insensible, so that the only inconvenience the patient suffers arises from the bulk of the tumour at the Anus.

No. 14, 14. are affixed upon the Muscular Fibres of the Glutei Maximi muscles.

* Vide Hen Callisen, Systema Chirurg. Hodiern. Hafniæ 1800, vol. ii. p. 523.

PLATE VII.

THIS Plate is a copy of one of SCARPA'S celebrated Engravings illustrative of Hernia. It exhibits, in a very distinct manner, the anatomy, not only of the parts concerned in the operations for Inguinal and Crural Herniæ, but also, that of the parts operated upon for Femoral and Popliteal Aneurisms.

No. 1, 1, 1, point out the thin Membrane which lies under the skin of the abdomen, and which has been turned down in order to shew the tendinous expansion that is connected with the external oblique muscle of the abdomen.

Upon removing, with care, the skin of the belly, a thin Fascia, No. 1, 1, 1, or rather membrane, presents itself, which has been said by some to take its rise only from the inferior part of the tendon of the external oblique muscle, and has been described by CAMPER.

It rarely exhibits a fibrous appearance in the adult, but the fibres, when distinct, pass in a transverse direction with respect to the abdomen. These fibres do not resemble tendinous fibres, being neither to the eye glistening, nor communicating to the touch the same dense feeling as tendon.

This membrane is proportionally thicker in the fœtus.

This fascia, which has always appeared to me to consist of condensed cellular substance, covers the spermatic cord and round ligament of the uterus, and also some of the inguinal glands of the upper and under cluster; and may, in some subjects, at the upper part of the thigh, be divided into layers, between which some small lymphatic glands are placed.

In a few cases, it may be readily traced for six or eight inches down the thigh.

This membrane, in some cases of scrotal hernia, attains a very considerable thickness; in others, it adheres so intimately to the hernial sac, that it is impossible to separate the one from the other.

No. 2. and 2. point out the Tendinous Expansion of the external oblique muscle; and

No. 3. the separation of those Tendinous Columns which form the under abdominal aperture.

The under part of the tendon of the external oblique muscle, stretched between the anterior superior spinous process of the Os Ilium, No. 5, and the Symphysis Pubis, No. 4, is thicker and stronger than any other part of it, and somewhat rounded, especially towards the ossa pubis, and has been described under the name of POUPART'S Ligament: and, more lately, it has been called by anatomists Crural Arch. It is marked No. 7, 7, as it extends over the flexor muscles, great bloodvessels, and nerves of the thigh.

This under part of the tendon was formerly supposed to be attached only to the anterior superior spinous process of the ilium, and the ligament of the symphysis pubis.

Mr GIMBERNAT has, however, shewn, that the tendon is doubled inwards, and forms a canal for the spermatic cord in the male, and for the round ligament of the female uterus.

POUPART'S Ligament, or the Crural Arch, is sometimes *double. I have seen two such ligaments on each side.* When that is the case, the one ligament is generally fixed about a line above the tubercle of the pubes, and the other is found in its usual situation.

About an inch or a little more from the symphysis pubis, the tendon of the external oblique muscle is generally divided into an upper and under column; but, in some instances, the division takes place at a greater distance from the symphysis pubis. Between the tendinous columns, which are connected at the upper part by a few transverse tendinous fibres, a space intervenes somewhat of an oval figure, which has been commonly called the Spermatic Ring; but this term conveys an inaccurate idea of the form of this aperture, and it should be called Inguinal or Abdominal Aperture, with the addition of the word *Under*, to distinguish it from the *Upper* Inguinal or Abdominal Aperture.

Through the under abdominal aperture, the spermatic cord passes; and, in the female, the round ligament of the uterus. There is no direct opening into the abdomen, the passage being shut up by the internal oblique, and transverse muscles, and by the fascia transversalis.

The under abdominal aperture in the male, is somewhat curved above, angular below, and directed obliquely downwards and inwards, and the sides of it are thicker than its upper or under part, being formed of the straight fibres of the tendon; whereas the thinner tendinous substance, which connects the thicker fibres of the tendon, form the upper part of the aperture. In the male, the under inguinal aperture is about an inch in length, but in the female it is rather longer, and also narrower.

No. 5. is placed upon the anterior and superior Spinous Process of the Os Ilium, and No. 4. upon the Symphysis Pubis.

No. 6. points out the Pubes.

The Crural Bloodvessels, Lymphatic Vessels of the inferior extremities, the internal Iliac and Psoas Vessels, and the protruded Bowels, No. 8, 8, in cases of Crural Hernia, pass behind the Crural Arch.

No. 9. marks the Hernial Sac, formed by the protruded Peritonæum, which was covered by cellular substance.

The tumour formed by a Crural Hernia, when detached from the other parts, is very different from that of an Inguinal Hernia; it has a long narrow neck, of an uniform diameter, and then suddenly expands into a body, the breadth of which is generally greater than its length.

Crural Herniæ are generally filled by a portion of intestine, and frequently by a process of intestine somewhat like the finger of a glove, which adheres to the side of the protruded intestine, and has hence been called Diverticulum.

It is obvious that the Crural Hernia is placed under the crural arch (supposing the body to be erect), and also that the neck of the tumour is deeper situated than the Inguinal Hernia, and that by its pressure upon the Femoral Vein, No. 14., and the Vena Saphæna Major, No. 15., it will occasion œdema of the thigh, leg, and foot of the same side.

No. 10. points out the Spermatic Cord, covered by the Cremaster Muscle. The cord passes obliquely through the inguinal canal of the adult, by which the prolapse of the contents of the abdomen is, to a certain degree, prevented; and owing to this cause, a recent inguinal hernia is situated obliquely.

No. 11. points out the Femoral Artery, accompanied by the corresponding vein, marked by No. 12., which lies on its inner or pubal side.

Nos. 13. 13. are placed on the anterior Crural Nerves.

A representation is given in this Engraving of a Crural Hernia, which is placed on the pubal side of the femoral vein.

The relative situation of the femoral artery, in respect to the anterior and superior spinous process of the ilium, marked by No. 5., and the symphysis pubis, marked by No. 4., merits attention. That artery is equidistant between the anterior spinous process of the ilium and the symphysis pubis.

Opposite to No. 11. the origin of the Epigastric Artery is seen, and the continuation of that artery is marked by No. 12.

The hernial tumour is placed on the pubal side of the epigastric artery.

There is much variety as to the origin of the Epigastric artery. Generally it takes its rise about an inch from the crural arch. It is then reflected upwards and inwards behind the spermatic cord, and on the inner side of the upper abdominal aperture. The artery then passes behind the rectus abdominis muscle, and ascends to meet with the smaller branches of the internal mammary artery, upon the back-part of the rectus abdominis.

In the female, a branch of this artery passes along the round ligament of the womb, and there are branches of it which go to the mons veneris and labia pudendi.

The Epigastric Artery sends a small branch, which is distributed upon the pubal side of GIMBERNAT'S ligament; a second, which passes through the inguinal canal; and a third to the spermatic cord, which communicates with the spermatic artery, behind the peritonæum.

In the common inguinal hernia, the epigastric artery is placed nearer to the symphysis pubis than the protruded bowels, and, by the displaced bowels, is pressed still nearer to it; but when the bowels do not follow the whole course of the inguinal canal, but pass through the under abdominal aperture only, as in the *ventro-inguinal hernia*, the epigastric artery is between the spine of the ilium and the protruded bowels: hence, if the incision for the removal of the stricture be made on the pubal side of the hernia, the epigastric artery will be divided, if the hernia be the common inguinal; and if, on the other hand, the incision for taking off the stricture be made on the ilial side of the tumour, the epigastric artery may probably be divided, if it be a ventro-inguinal hernia. As during life there is a difficulty in distinguishing the common from the more rare ventro-inguinal hernia, hence the greater safety of making the incision for taking off the stricture in the middle of the neck of the hernial tumour.

Many small branches of this artery are distributed upon the integuments of the abdomen, which sink into the substance of the recti and other muscles of the abdomen; and anastomose with the thoracic, intercostal, and lumbar arteries.

The epigastric artery and spermatic cord decussate each other like the strokes of the letter X. The point of decussation of the epigastric artery and the spermatic cord is well seen in this Engraving, and merits the attention of the surgeon who is about to operate for the cure of a crural hernia. The decussation of the round ligament of the uterus and of the epigastric artery, is represented in my Book on Crural Hernia, and also in my Observations on the Morbid Anatomy of the Stomach, Gullet, and Intestines.

That part of the crural arch over the sac, marked by No. 7., was supposed to be the seat of the stricture made upon the displaced bowels; but GIMBERNAT has proved, that it usually proceeds from the third insertion of the external oblique muscle, which is fixed into the anterior part of the Linea Ilio-pectinea, which is deep seated, and placed nearly horizontally.

It appears to me, that, as the third insertion of the external oblique muscle into the anterior part of the crural arch, is the most frequent seat of the stricture in cases of Crural Hernia, and as the division of that part cannot be attended with any bad consequence, unless the obturator artery follows a very unusual course, this is the best and safest mode of taking off the stricture in cases of Crural Hernia; and the division is easily made by a thin-bladed knife, conducted by a director, the back of which is turned to the intestine, and its groove towards the symphysis pubis, which, after the hernial sac has been laid bare, is to be introduced within the crural aperture.

The dotted line from No. 14. points out the Femoral Vein, and No. 15. the Vena Saphæna Major, through which the blood flows into the deeper-seated femoral vein.

The relative situation of the femoral artery in respect to the neighbouring points, and especially towards the sartorius muscle, Nos. 16, 16, and also in respect to the neighbouring Nerves, is in this Engraving well represented. Owing to the deep situation of the artery, and its immediate vicinity to the crural nerves, it is obvious that the compress cannot, in cases of bleeding, be applied so as to obliterate the femoral artery, No. 11.

Mr J. HUNTER recommended taking up the femoral artery above the middle of the thigh, or before it passes between the insertion of the triceps adductor femoris into the thigh-bone, for the cure of the popliteal aneurism; or opposite to No. 14. of this Figure, where the femoral artery passes on the inner edge of the sartorius muscle, marked by Nos. 16, 16.

SCARPA prefers taking up the artery in the upper third of the thigh, because the artery in that place is nearer to the skin, and also, because the surgeon is not embarrassed by taking up the sartorius muscle, which must be partially removed from its place, in order to get at the femoral artery, in Mr HUNTER'S method of operating.

It may be observed, that, by bending the thigh and leg, and turning the foot of the same side outwards, the course of the sartorius muscle becomes, in the living person, quite distinct;—and by putting the limb of a patient who is about to undergo the operation for popliteal aneurism in such a position, the place of the sartorius muscle thus becomes very obvious to the eye.

The immediate contiguity of the deep femoral vein, No. 12., and anterior crural nerves, No. 13, 13, is well seen in this Engraving. In performing the operation for Popliteal Aneurism, the artery should be carefully detached only to *a small extent from the adjacent parts*, before the ligature is thrown around it.

If the artery be detached to a considerable extent, the vessels which supply its coats are also detached: the blood does not reach these; the coats of the included portion of artery are thereby killed and it may be observed, that this was the cause of the earlier operations for the cure of popliteal aneurism, performed in the middle of the thigh, proving unsuccessful; for, at that time, two, three, or four different ligatures were thrown around the femoral artery.

PLATE VIII.

HÆMORRHAGE very frequently occurs after the lateral operation of lithotomy has been performed, and has sometimes proved a cause of death; and hence the importance to the surgeon of an exact knowledge of the distribution of the arteries and veins proper to the bowels of the pelvis.

In Plate V. the distribution of the arteries has been represented; but it has since occurred to me that a more direct view, or orthographic projection, would be more acceptable; and therefore I have given such a representation in the subjoined engraving, which was taken from the body of a young man, after a very careful dissection of the pudic arteries.

A, The Sphincter ani.
B, The anterior termination of that muscle.
C, The Accelerator urinæ.
D, The Erector muscle covering the Crus penis.
F, The continuation of the Crus penis.
G, The Transversalis perinæi muscle.
H, H, The trunks of the internal Pudic arteries; their progress along the ascending rami of the ischia is seen.
L, The branch of the internal Pudic artery, which follows a tortuous course, and passes into the bulb of the urethra.
M, The continuation of the internal Pudic artery.

PLATE IX.

AN unusual branch is sometimes sent off from the internal iliac artery, which passes along the side of the bladder and prostate gland.

This deviation from the usual distribution of arteries is not very rare, and merits particular attention.

HALLER, in his 4th Fasciculus, observes, that the older anatomists have described the Pudic artery as passing along the prostate, and under the symphysis pubes.

In my Outlines of Anatomy, I have mentioned that the late Mr ALLAN BURNS of Glasgow shewed me two instances in which a branch of the pudic artery followed such an unusual course.

TIEDEMANN, in his 30th plate, has represented the left dorsal artery of the penis as passing over the prostate gland; and in a note to the explanatory text of the plates, he observes, that he had met with a similar distribution of the arteries on both sides, in the person of a man of 20 years of age, and also in a boy; and that he had seen a similar distribution in the arteries passing to the clitoris.

Mr HARRISON of Dublin has observed, that the internal iliac had given off a distinct branch, which ran along the side of the bladder and prostate gland, and passing beneath the arch of the pubes with the dorsal veins, became the dorsal artery of the penis. "Should such a variety exist," he adds, "in one who was to become the subject of the lateral operation of lithotomy, I fear this artery must be wounded; and, judging from its size and situation in those cases in which I have seen it take this course, I should apprehend very serious consequences from its division."

It is not improbable but that some of those alarming cases of hæmorrhage which have occurred even to the best of operators, may have depended on this variety.

Mr SHAW of London was so unfortunate as to operate upon a man in whom such a distribution existed. He observes, "feeling the staff through the face of the prostate, I cut upon it, and carried my knife forward through the membranous part of the urethra and prostate, following and directing the point with the fore-finger of my left hand. On making this incision, there was a gush of fluid. I thought that it was urine; but on observing it flowing over the back of my left hand, I saw that it was blood. The patient died the same day, in consequence of bleeding."

I have seen two cases lately, in which there was such an unusual distribution of arteries. One of these was shewn to me by Dr MILLIGAN: the other occurred in a small subject, in which a branch of the Pudic artery passed along the ilial side of the bladder of urine, and about one inch and a half from the urethra, and then passed through the ilio-vesical fascia, and divided into three branches, one of which entered the bulb of the urethra, a second the crus penis, and the third ran along the dorsum of the penis.

The internal Pudic artery, which was smaller than usual, followed its usual course: it passed between the sacro-sciatic ligaments, then passed on the inner side of the tuberosity of the ischium, and sent off the external hæmorrhoidal and perineal arteries.

A, The Anus.
B, One of the Thighs.
C, C, C, The skin turned back.
D, The tuberosity of the Ischium.
C, The Crus penis, covered by its erector muscle E.
F, The trunk of the internal Pudic artery.
G, The Bulb of the Urethra.
H, The continuation of the unusual branch from the internal Iliac, which passed along the side of the bladder and the prostate gland, and becomes the Dorsal artery of the Penis.

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PLATE IX.

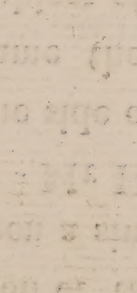
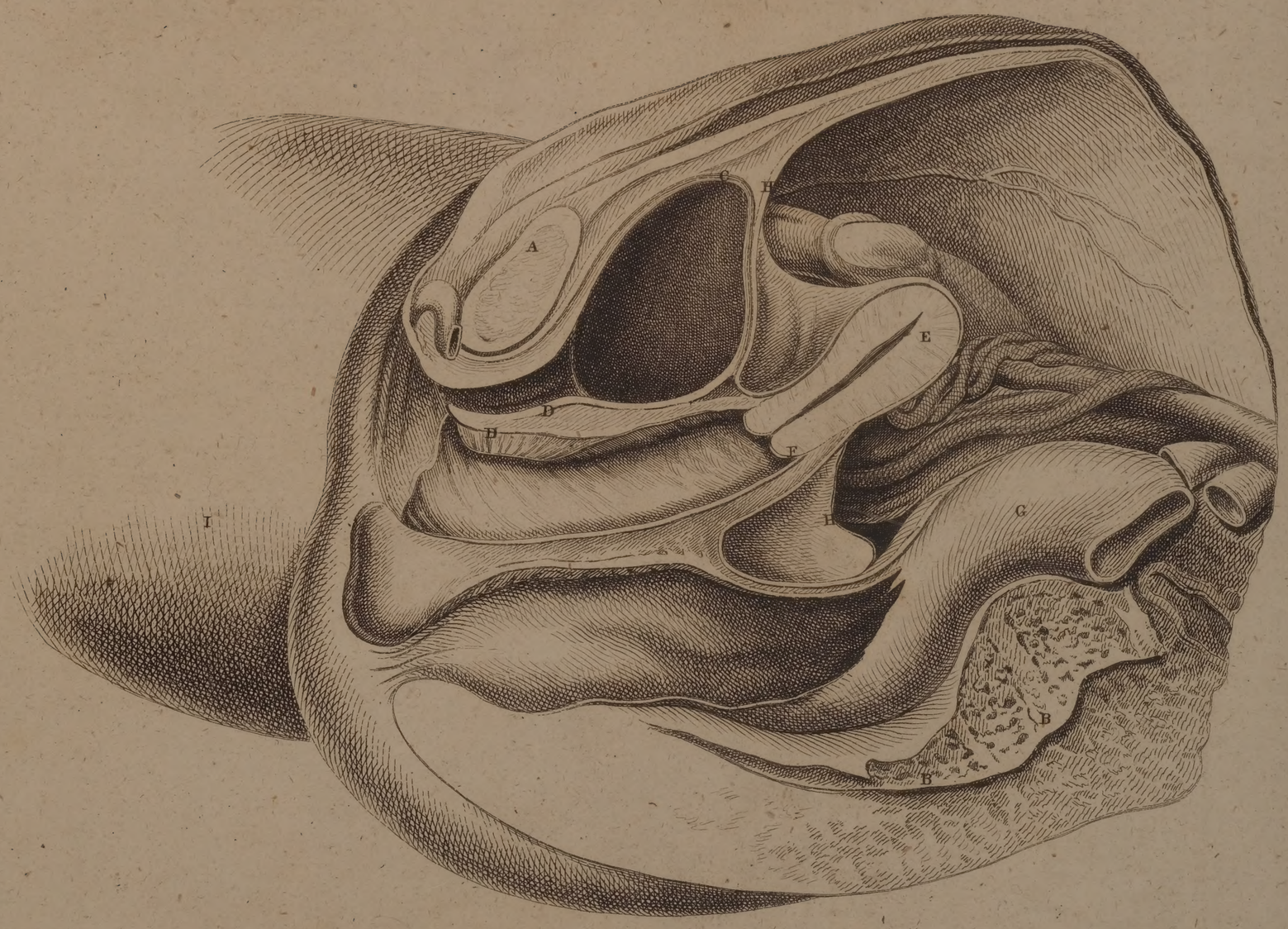


Fig. 1.

Fig. 2.



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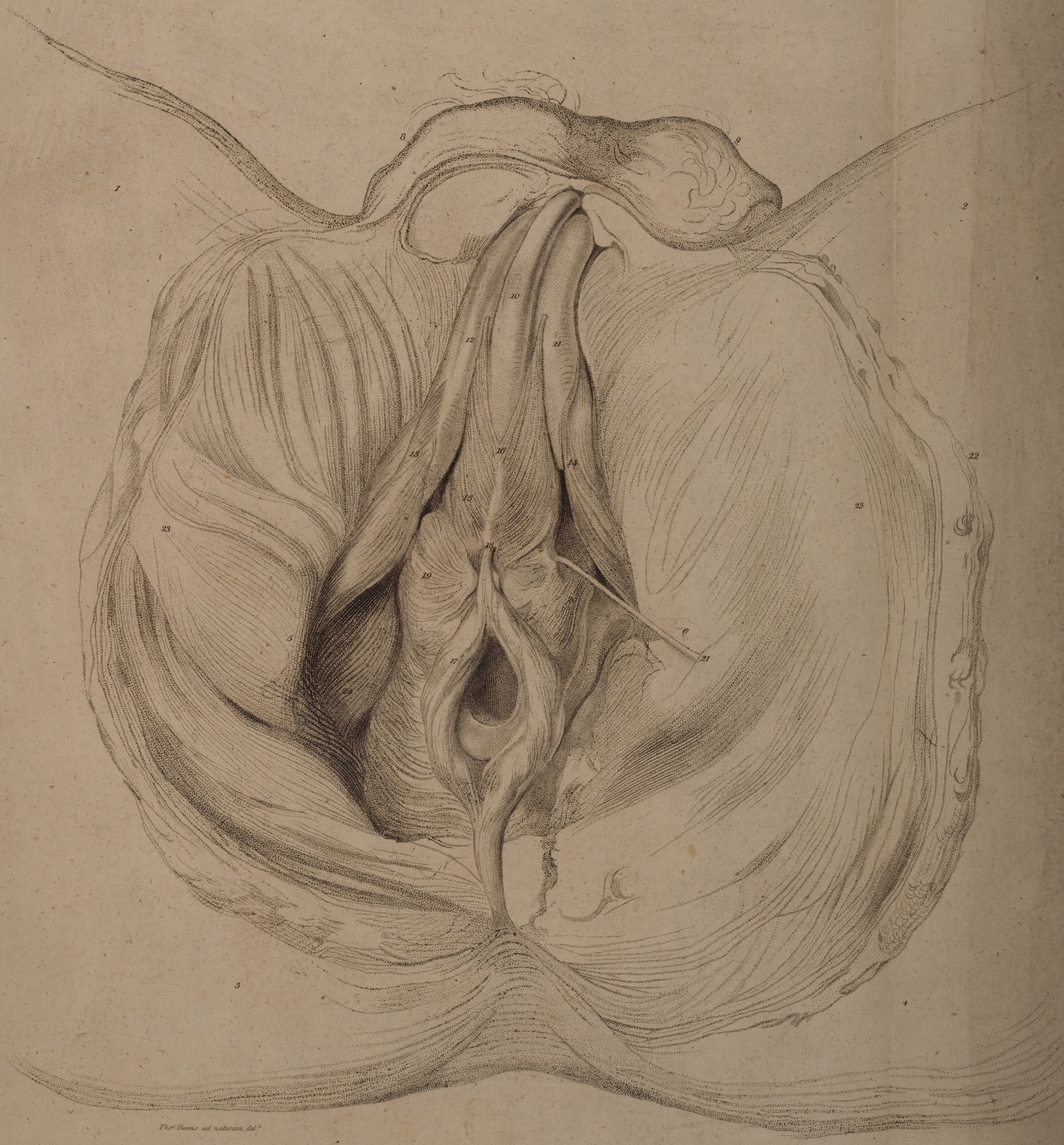
TAB. II.



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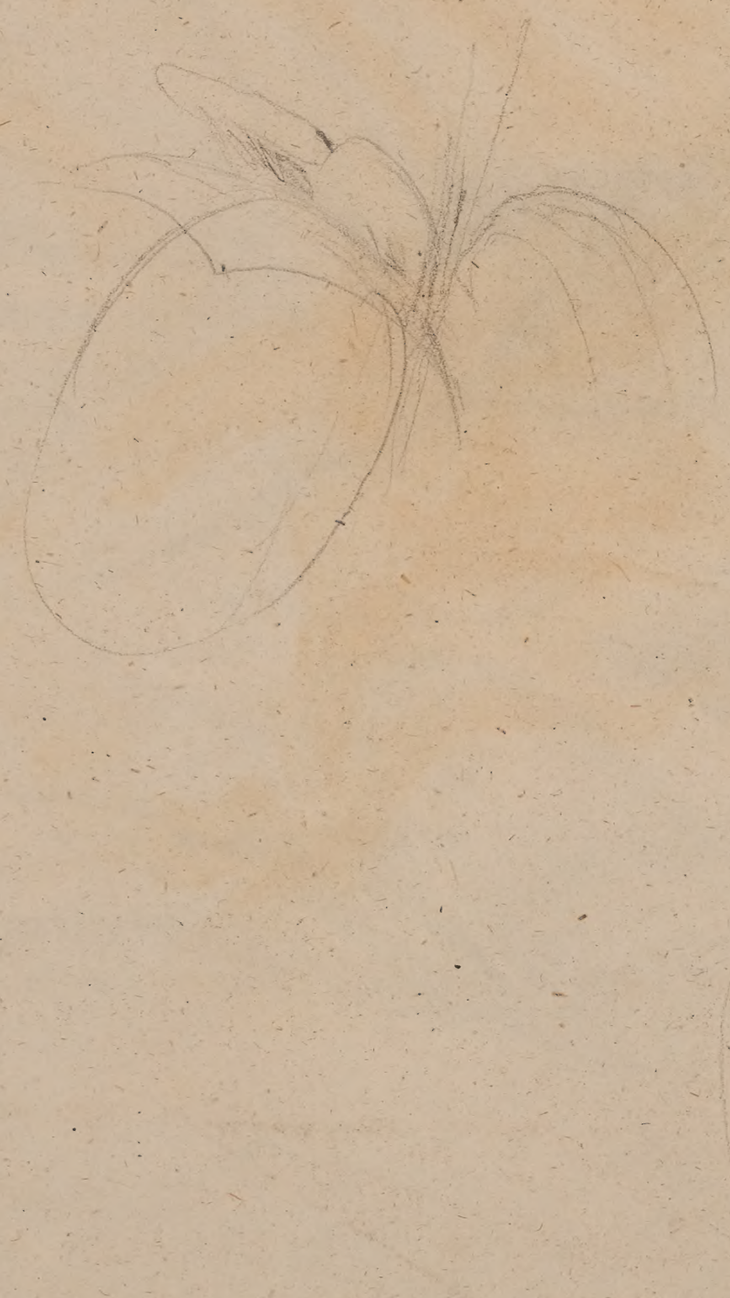

TAB. 3ª.

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J.Horsburgh